

Course Outline - MIMM 465, Bacterial Pathogenesis (Fall 2022)

Department of Microbiology & Immunology, McGill University

Course description:

Bacterial diseases have shaped the course of human history and the evolution of modern medicine itself. Students enrolled in this **3-credit** course will be exposed to the fundamental principles and recent advances in the field of bacterial pathogenesis - ie. the mechanisms by which bacteria are able to infect and cause disease. The course will also delve into the approaches that have been developed to prevent and treat bacterial infections (eg. antibiotics). In the second part of the course, students will develop their ability to critically read, interpret and present scientific research findings to their peers. Here we will survey and discuss recent groundbreaking research articles that have advanced our understanding of the range of pathogenic strategies employed by the most globally important bacterial pathogens.

Course Coordinator & Instructor:

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Lecture Time, Location:

Monday & Wednesday from 11:35am to 12:55pm - In-person (Duff Amphitheatre) or via live remote delivery via Zoom/ myCourses depending upon the prevailing COVID-19 situation.

Course Prerequisites:

Introductory Immunology (**MIMM 214**), Microbial Physiology and Genetics (**MIMM 323**) & Molecular Microbiology Lab (**MIMM 384**)

Instructional Method:

- Lecture course presented by a series of experts in the field of bacterial pathogenesis [**Section 1**]. Here we will cover a diverse set of relevant topics (see course schedule) ranging from virulence factors to the evolution of bacterial pathogenesis, pathogen genomics and the role of the microbiome in protection from disease, to antibiotics and antibiotic resistance.
- Structured seminars presented by groups of 4 - 5 students (per class) on assigned research papers that cover 18 major bacterial pathogens [**Section 2**]. The species selected (see course schedule) inhabit a wide range of ecological niches and exhibit diverse strategies for establishing infection and causing disease. The question and discussion period that follows will also be led by an assigned group of students.

Learning Outcomes:

1. Students will learn the major strategies and molecular mechanisms by which globally important bacterial species have evolved to invade host cells and tissues, establish infection, and to cause disease.
2. Students will learn specific examples of the diversity that exists amongst bacterial pathogens in terms of the types of disease and pathology they cause, their modes of transmission, and the environmental niches they inhabit.
3. To learn how key experimental approaches/ techniques are applied to the study of bacterial pathogenesis. This includes, for example, the emerging areas of microbiome research, as well as genomics applied to the study of bacterial infections.
4. To understand the mechanisms by which antibiotics exert their antibacterial effects, as well as the ways that bacteria have evolved to counter these important compounds.
5. To read and critically interpret primary scientific literature in the field of bacterial pathogenesis.

6. To develop skills and confidence in presenting published primary scientific research to an audience of your peers, including the ability to ask and answer questions.

Course Materials:

- Lecture material (**Section 1**) and research articles to be used as the basis for the student seminar presentations (**Section 2**) will be made available in PDF format via myCourses.
- Suggested textbook (optional only, not essential): ***Bacterial Pathogenesis - A Molecular Approach, 4rd edition*** (2019); B. A. Wilson, M. E. Winkler & Brian T. Ho [ASM Press, Washington, DC].

Course Evaluation:

1. Mid-term quiz based on material presented in Section 1 (**15% of final grade; 1hr timed exam, to complete within a 24 hour time-frame**).
2. Grading based on components of Section 2 (**50% of final grade**). This includes the following 3 components:
 - Presenter assignment (one group of 4 - 5 students per class; final group sizes are based on the total course enrolment): **30%**
 - Note: This assignment requires a high level of scientific analysis which is reflected in the associated grading rubric, the detailed instructions, and sample presentation provided in class. Grading for this assignment will be based on preparation of the presentation (**10%**) and the actual presentation itself (**20%**). As this is a group assignment the overall grade will reflect both group and individual contributions. In the event that the course is held remotely, presentations may need to be uploaded and available for viewing 24 hours prior to the assigned class time.
 - Reviewer assignment (one group of reviewers per class): **10%**
 - Note: Each student in the reviewer group is responsible for submitting their own short written assignment that is graded according to a standard rubric. This written assignment is based on the research paper under discussion that day and is worth **7%**. The remaining **3%** requires students to actively participate in the discussion (held "live" during the scheduled class time) by asking one or more questions. Students are not expected to grade the presentations of their peers.
 - Summary "quizzes": **10%**
 - Students are required to attend the presentations of their peers, that includes

the Q&A/ discussion session and complete a brief written summary “quiz” for at least 16 out of the 18 presentations. These “quizzes” ask students to briefly summarise the main scientific points from that day’s presentation and provide an opportunity to practice writing feedback. These are formative assessments that ensure that students are attending and actively engaged with each of the presentations.

* Each student will be required to serve as presenter or reviewer only ONCE throughout the course.

3. Final exam based on material presented in Section 2 and consisting of written, short-answer questions (**35% of final grade; take-home exam - 72 hours to complete**).

Note: The Department of Microbiology and Immunology is taking steps to assist students who need to miss a midterm examination due to medical or analogous reasons in order to limit the need to approach multiple professors for accommodations. Students must complete the Missed Midterm Exam Form at <https://www.mcgill.ca/microimm/undergraduate-programs/request-missing-mid-term-exam> within 1 week of the scheduled midterm, or else they will receive a grade of zero for the midterm. We will evaluate any non-medical situations and reserve the right to make final decisions regarding what accommodations are reasonable and appropriate in the circumstances. Please consult the Student Wellness Hub for sources of support (<https://www.mcgill.ca/wellness-hub/>)

McGill University Policy Statements:

- *McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see: www.mcgill.ca/students/srr/honest/ for more information).*
- *In accord with McGill University’s Charter of Students’ Rights, students in this course have the right to submit in English or in French any written work that is to be graded.*
- *The [University Student Assessment Policy](#) exists to ensure fair and equitable academic assessment for all students and to protect students from excessive workloads. All students and instructors are encouraged to review this Policy, which addresses multiple aspects and methods of student assessment, e.g. the timing of evaluation due dates and weighting of final examinations.*
- *© Instructor generated course materials (e.g. handouts, notes, summaries, exam questions, etc.) are protected by law and may not be copied or distributed in any form or in any medium without explicit permission of the instructor. Note that infringements of copyright can be subject to follow up by the University under the Code of Student Conduct and Disciplinary Procedures.*

- *As an instructor of this course I endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me, or the [Office for Students with Disabilities](#) (514-398-6009).*
- *[End-of-course evaluations](#) are one of the ways that McGill works towards maintaining and improving the quality of courses and the student's learning experience. You will be notified by e-mail when the evaluations are available. Please note that a minimum number of responses must be received for results to be available to students.*
- *In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.*
- *Additional policies governing academic issues which affect students can be found in the McGill Charter of Students' Rights (see <https://www.mcgill.ca/students/srr/policies-student-rights-and-responsibilities>).*
- *McGill has policies on sustainability, paper use and other initiatives to promote a culture of sustainability at McGill (See the [Office of Sustainability](#)).*